InfiniScale® IV 8-Port QSFP 40Gb/s InfiniBand Switch User Manual

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Rev 1.2

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QDR InfiniBand Switch Platform User Manual

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Revision History

Table 1 - Revision History Table

Date	Revision	Description
Mar. 2011	Rev 1.2	Added note and figure to blank panel installtion step. Made changes to the installation process for the *two switch frame*. Made changes to FW burning sections.
Feb. 2011	Rev 1.1	Removed UID LED support
Jan. 2011	Rev 1.0	Initial Release

About this Manual

This manual describes the installation and basic use of the Mellanox IS5022 switch, which is based on the InfiniScale® IV InfiniBand switch device.

Intended Audience

This manual is intended for users and system administrators responsible for installing and setting up the switch platforms listed above.

The manual assumes familiarity with the InfiniBand® Architecture Specification.

Related Documentation

Additional Documentation available from Mellanox:

Table 2 - Reference Documents

Switch Firmware and Firmware Update Tools	See http://www.mellanox.com > Support > Download Firmware Tools Note that the Switch System described in this manual is based on Mellanox Technologies' InfiniScale® IV switch device.
Mellanox OFED Stack for Linux User's Manual	See http://www.mellanox.com > Support > InfiniBand Software and Drivers Click "Mellanox OpenFabrics Enterprise Distribution for Linux (MLNX_OFED)" Select the Linux User's Manual The embedded OS and tools on the CPU in the management module is a subset of the Mellanox OFED stack.
Mellanox Firmware Tools (MFT) User's Manual Document # 2329	The MFT (Mellanox Firmware Tools) package is a set of firmware tools. The manual supplied with this package provides an overview of the firmware its installation and replacement. The MFT can be downloaded with its documentation at: http://www.mellanox.com > Support > Download Firmware Tools

Conventions

Throughout this manual, the name IS5022 and the term switch are used to describe the 8-port QSFP 40Gb/s InfiniBand Switch unless explicitly indicated otherwise.

This symbol indicates information that is helpful to the user.

BEWARE! This symbol indicates a situation that can potentially cause personal injury or damage to hardware or software.

Mellanox Part Numbering Legend

Place	Field	Decoder
M		Mellanox Technologies
IS	System Type	InfiniScale Switch
50	Model	Family
FF	Form factor	22 = 8 Ports
-	Separator	
#	Power supplies	1 = 1 power supply
M	Depth of the Unit	B = short depth
Y	Air Flow direc- tion	R= Connector side to rear side airflow F= Rear side to connector side airflow
R	RoHS	R=RoHS6

1 Overview

This *User Manual* provides an overview of the InfiniBand switch product, an 8-port switch capable of up to 640Gb/s of non-blocking switching capacity. Based on the fourth generation InfiniScale IV InfiniBand switch device. The platform delivers industry leading bandwidth, latency, and scalability in a half width 1U form factor. The platform can be tiered to build larger multi stage networks in a variety of topologies such as Fat-Tree, Mesh, 3D Torus etc. All port configurations are covered in this manual which include switches for QSFP InfiniBand ports.

Mellanox IS5022 switch systems are an ideal choice for smaller departmental or back-end clustering uses with high-performance needs, such as storage, data base and GPGPU clusters. Networks built with IS5022 systems can carry converged traffic with the combination of assured bandwidth and granular quality of service. IS5022 systems provide up to 40Gb/s full bidirectional bandwidth per port.

The switch platform comes pre-installed with all necessary firmware and is configured for standard operation within an InfiniBand fabric. This switch requires an InfiniBand compliant Subnet Manager running from one of the hosts or another managed switch. All that is required for normal operation is to follow the usual precautions for installation and to connect the switch to the HCAs or other switches within the fabric. Once connected, the Subnet Management software automatically configures and begins utilizing the switch.

It is recommended that the Mellanox OpenFabrics software package be installed on all nodes connected to the IS5022. The software package provides a subnet manager and network management tools as well as connectivity software for servers and storage, and is available on the Mellanox web site. See Chapter 3 for more information.

Basic installation and hardware maintenance is covered in “Hardware Basic Operation and Installation” on page 15.

1.1 Serial Number and Product Version Information

The Serial number and GUID for the switch are found on the front panel below the Mellanox logo. The serial number and product version information are found on the label seen in the figure below.

Figure 1: Generic Product label

Also on this label is the GUID identifier for the switch.

2 Installation Safety Warnings

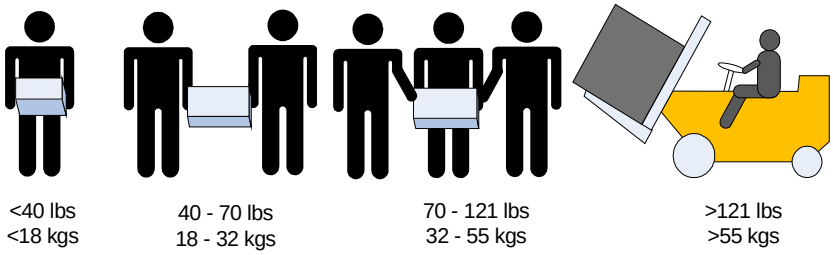
Warnings in French can be found on page 44. Warnings in German can be found on page 46. Warnings in Spanish can be found on page 48.

1. Installation Instructions

Read all installation instructions before connecting the equipment to the power source.

2. Bodily Injury Due to Weight

Use enough people to safely lift this product.



3. Over-temperature

This equipment should not be operated in an area with an ambient temperature exceeding the maximum recommended: 45°C (113°F). Moreover, to guarantee proper air flow, allow at least 8cm (3 inches) of clearance around the ventilation openings.

4. Stacking the Chassis

The chassis should not be stacked on any other equipment. If the chassis falls, it can cause bodily injury and equipment damage.

5. During Lightning - Electrical Hazard

During periods of lightning activity, do not work on the equipment or connect or disconnect cables.

6. Copper InfiniBand Cable Connecting/Disconnecting

Copper InfiniBand cables are heavy and not flexible, as such they should be carefully attached to or detached from the connectors. Refer to the cable manufacturer for special warnings/instructions.

7. Rack Mounting and Servicing

When this product is mounted or serviced in a rack, special precautions must be taken to ensure that the system remains stable. In general you should fill the rack with equipment starting from the bottom to the top.

8. Equipment Installation

This equipment should be installed, replaced, and/or serviced only by trained and qualified personnel.

9. Equipment Disposal

Disposal of this equipment should be in accordance to all national laws and regulations.

10. Local and National Electrical Codes

This equipment should be installed in compliance with local and national electrical codes.

11. UL Listed and CSA Certified Power Supply Cord

For North American power connection, select a power supply cord that is UL Listed and CSA Certified, 3 - conductor, [16 AWG], terminated with a molded plug rated at 125 V, [13 A], with a minimum length of 1.5m [six feet] but no longer than 4.5m.

For European connection, select a power supply cord that is internationally harmonized and marked “<HAR>”, 3 - conductor, minimum 1.0 mm 2 wire, rated at 300 V, with a PVC insulated jacket. The cord must have a molded plug rated at 250 V, 10 A.

12. Add GND connection information

Before connecting this device to the power line, the protective earth terminal screws of this device must be connected to the protective earth in the building installation.

(GND Connection Information):

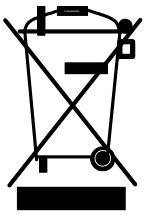
The building installation shall provide a means for connection to protective earth; and the equipment shall to be connected to that means permanently by a service person.

A SERVICE PERSON shall check whether or not the socket - outlet from which the equipment is to be powered provides a connection to the building protective earth. If not, the SERVICE PERSON shall arrange for the installation of a PROTECTIVE EARTHING CONDUCTOR from the separate protective earthing terminal to the protective earth wire in the building. The equipment shall be installed in area where equipotential bonding exists (such as a telecommunication centre or a dedicated computer room)

13. Installation codes

This device must be installed according to the latest version of the country national electrical codes. For North America, equipment must be installed in accordance to the applicable requirements in the US National Electrical Code and the Canadian Electrical Code.

14. WEEE Directive



According to the WEEE Directive 2002/96/EC, all waste electrical and electronic equipment (EEE) should be collected separately and not disposed of with regular household waste.

Dispose of this product and all of its parts in a responsible and environmentally friendly way.

3 Externally Managed Switches

Externally managed (unmanaged) switches are plug and play out of the box. All switches come with the latest firmware (FW) burned on the Flash. Updating the FW on externally managed switches can be performed in-band only. When new FW is available, an email notification is sent to registered users with the link to the Mellanox FW download site. The download site has the Mellanox FW tool package and full instructions for updating FW.

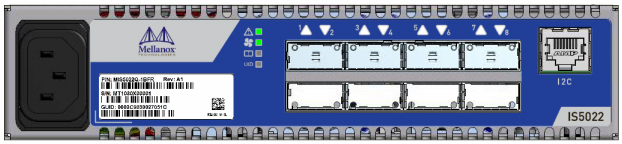
Externally managed switches must be managed by management software installed on a node or on another managed switch that can be anywhere in the fabric. This can be OpenSM, Mellanox FabricIT™ EFM, Mellanox UFM™, or a third party Subnet Manager.

4 Hardware Basic Operation and Installation

4.1 Switch Platform Hardware Overview

Figure 2 shows the front view of the switch. The figure shows port configurations for the switch systems, I2C connector, and various status LEDs. Externally Managed switches come with an I2C RJ45 connector.

Figure 2: Switch System Front Panel



All InfiniBand connectivity is via the connector side panel. All connectors can support active cables.

4.1.1 LED Assignments

4.1.1.1 System Status Indicators

The System Status Indicators are located on the left side of the front (connector side) panel. The system status indicators should display as follows:

When the switch is plugged in, within three seconds:

- the Status LED should light up green.
- The Fan LED should light up green.
- The Bad Port LED should be off.
- The Unit ID LED UID should be off.

Figure 3: Status LEDs

If the Status LED shows red after 30 seconds unplug the switch and call your Mellanox representative for assistance.

If the Fan LED shows red unplug the switch and call your Mellanox representative for assistance.

If the switch shuts down due to over temperature, unplug the switch, wait 5 minutes and replug in the switch. For more information See “Troubleshooting” on page 33.

4.1.1.2 Status LED

The Status indicator is located on the left side of the front panel (connector side) of the unit. The following status conditions are possible:

Table 3 - Switch Status LED Configurations

	LED Description
Off	No power to the switch
Solid Green	Switch is running All OK
Red	There is a problem with power output from the power supply, or there is a thermal shut down.

4.1.1.3 Fan Indicators

The Fan indicator is located on the left side of the front panel (connector side) of the unit. The following fan status conditions are possible:

Table 4 - Fan LED Configurations

LED Configuration	FAN LED
Off	There is no power to the fans.
Green	OK – The fans are running.
Red	Error – fans are not operating properly. Replace the switch.

Fans must be operating while the power supply is plugged in.

If the switch shuts down due to over temperature, unplug the switch, wait 5 minutes and replug in the switch. For more information See “Troubleshooting” on page 33.

4.1.1.4 Bad Port LED

The Bad Port indicator is located on the left side of the front panel (connector side) of the unit. The following Bad Port conditions are possible:

Table 5 - Bad Port LED Configurations

LED Configuration	Description
Off	OK – All ports are up and running.
Flashing Orange	Error –One or possibly more ports has just received a symbol error.

This LED shows symbol errors. Possible causes for this are:

- bad cable
- bad connection
- bad connector

This LED lights up when one or more ports is receiving a symbol error. The LED immediately goes off until the next symbol error is received.

4.1.1.5 UID LED Switch Identifier

The UID LED is a debug feature that will become available to customers in the near future. For details please contact Mellanox Technologies support.

4.1.1.6 Port Connector LED

Above the ports are two LEDs one for the upper port ▲ and one for the lower port ▼. The following table shows the port status according to the LED indication.

Table 6 - Connector Physical and Logical Link Indications

	LED Description
Off	No link
Orange	Physical Link up
Solid Green	Logical Link up
Flashing Green	Data activity flashing speed ≈ data transfer speed
Flashing Orange	A problem with the Physical Link

This LED when flashing orange shows port physical errors. Possible causes for this are:

- bad cable
- bad connection
- bad connector
- bad cage

4.2 Air Flow

These switches can come with two air flow patterns. The two patterns are

- Rear side inlet to connector side outlet
- Connector side inlet to rear side outlet

The air flow is specified in the product model number. See “Mellanox Part Numbering Legend” on page 9.

4.3 QSFP Cable Power Budget Classification

All IS5022 QSFP switches are designed for active cables with a max power per module of 2.0W. This is power level 2 according to the QSFP Public Specification.

4.4 Interfaces

4.4.1 Port Connector Interfaces

The Connector side of the switch has 8 QSFP ports. These are placed in two rows, 4 ports to a row. The ports are labelled as shown in Figure 4. The bottom row ports are flipped from the top row. See Figure 5.

Figure 4: Port Numbering

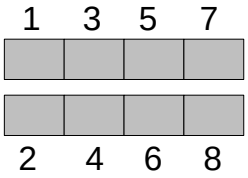
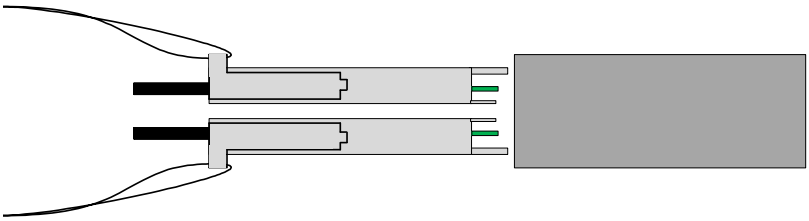


Figure 5: Top and Bottom Ports



4.5 Management and FW Updating Interfaces

This switch is externally managed. There is no CPU in this switch for management purposes. The switch can be managed through any fabric management software such as Open SM Mellanox UFM.

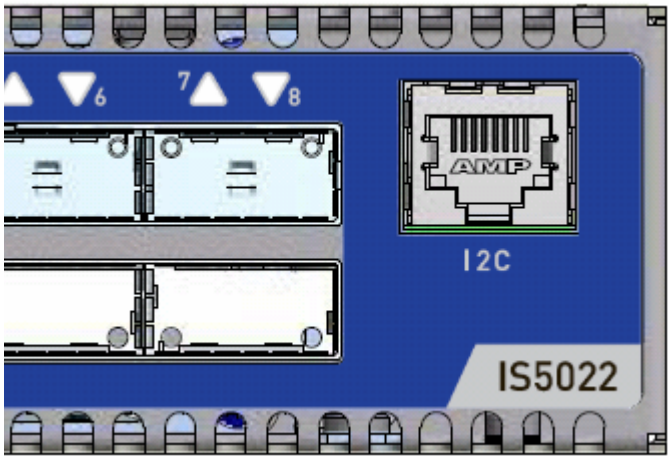
There is one interface to connect to the switch. It is an I2C RJ45 interface labelled “I2C”. Use this connector to update firmware (as a last resort) and for advanced debug.

Update FW inband only.

4.5.1 RJ-45 Connector (I2C)

There is an “I2C”interface on the front panel.

Figure 6: RJ45 I2C Connector



All firmware updates should be done in-band using Mellanox Firmware Management Tools.

The I2C connector is available only on externally managed switches and is used to update firmware should in-band firmware update not work. You will need to order an MTUSB-1 USB to I2C adapter to make use of the I2C interface. The I2C connection provides access to Flash. This is for Advanced users and FAEs only.

The externally managed switches are Plug and Play and all firmware updates should be done in-band. The I2C connection should only be used if the FW image was corrupted to the point that the regular FW tools cannot successfully reburn the correct image.

Warning: Any red status LED is cause for concern and must be dealt with immediately.

It can take up to 30 seconds to boot up, during which time the status LED may indicate red.

5 Installation

There are three possible installation kits for the MIS5022 switch. Make sure that you have the installation kit that works with your rack. Installation kits are not included with the switch and should be ordered separately.

Table 7 - Installation Kit Options

OPN	Description	For Rack Depths
MIS000811	Centered single switch installation kit	400mm – 800mm
MIS000830	Side by side installation kit with long rail slides	650mm – 800mm
MIS000831	Side by side installation kit with short rail slides	400mm – 650mm

5.1 Package Contents

The package includes:

- 1 switch
- 1 installation kit
- 1 box containing 1 power cord Type B 6ft US 125V 10A chord
- 1 installation guide
- 1 parts list

Before you install your new switch, unpack the system and check to make sure that all the parts have been sent, check this against the parts list. Check the parts for visible damage that may have occurred during shipping.

If anything is damaged or missing, contact your customer representative immediately.

The rack mounting holes conform to the IEA-310 standard for 19-inch racks. Guarantee proper ventilation, by leaving 8cm (3”) of space to the front and rear of the switch. This will ensure proper air flow through the chassis. This is crucial for maintaining good air-flow at ambient temperature. In particular, route cables such that they do not impede the air into or out of the chassis.

5.2 Installing the Switch in the Rack

This installation kit can only be used to install this switch.

Tools and Parts

Tools required and customer supplied parts

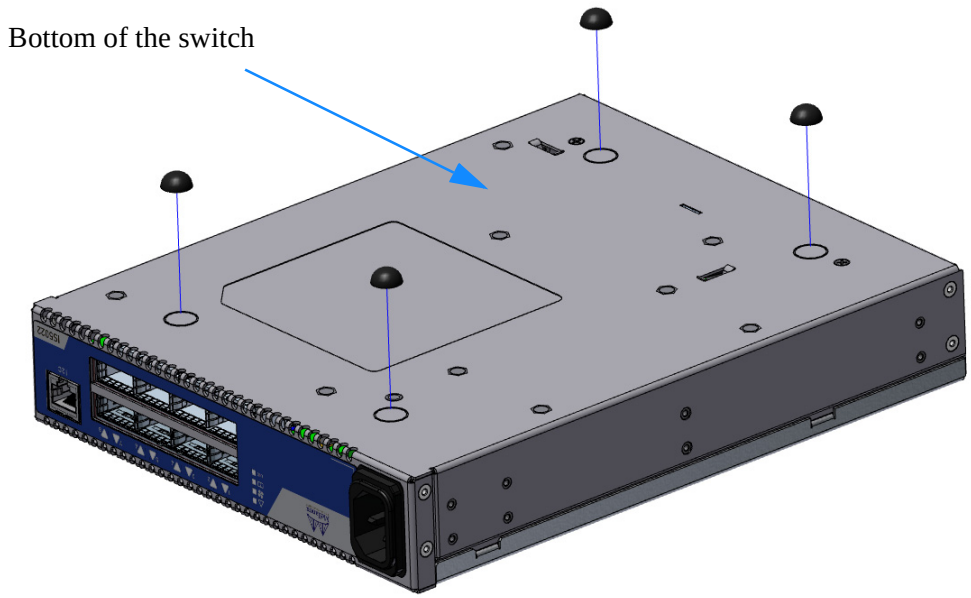
- Phillips Screwdrivers #1 and #2
- ESD Strap
- ESD mat
- Grounding screw
- Grounding wire sufficient to reach a valid ground

The following procedure can be done by one person.

5.2.1 Table Top Installation

1. Peel and stick the four rubber bumpers into the bottom of the switch. Place them in the round circles.

Figure 7: Placing the Bumpers



2. Place on a flat surface. Make sure the switch is sits solid on the surface.
3. Connect the power cord.

4. Connect the data transfer cables.

5.2.2 Installation Procedure for a Single Switch Center-of-Rack Installation

Installation kit parts for a single switch center-of-rack installation:

- 2 front mounting brackets
- 4 M6 bolts
- 8 flat head screws
- 4 caged nuts for the rack vertical supports

1. Place the ESD mat on the floor where you will be working and put on the ESD strap. Make sure the ESD strap is touching your skin and that the other end is connected to a verified ground.
2. Screw the two front brackets to the front side of the switch using 4 flat head screws for each bracket.

Figure 8: Installation Kit for a Single Centered Installation

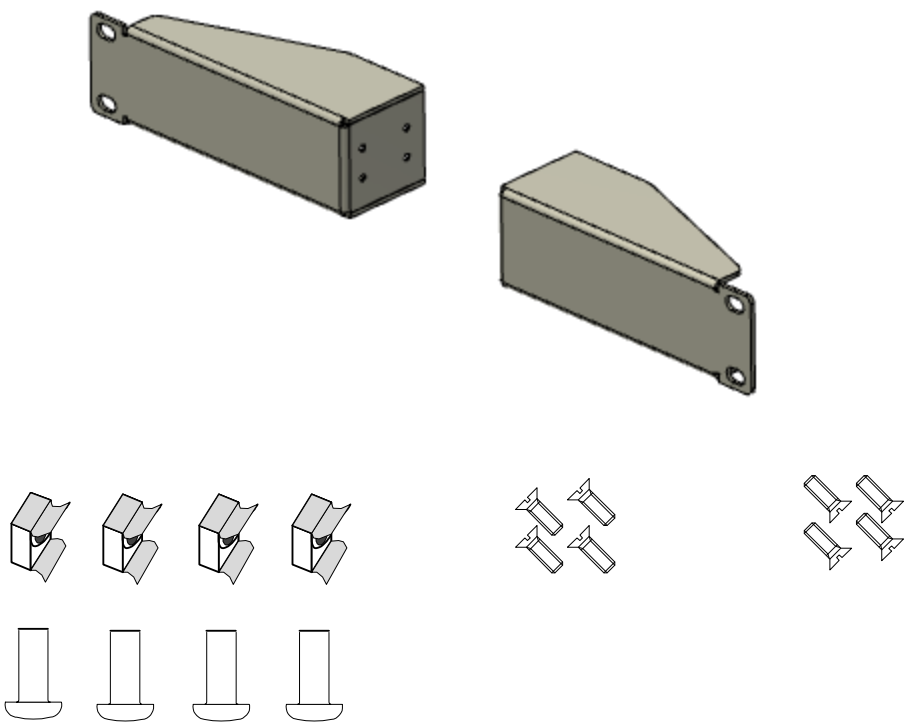
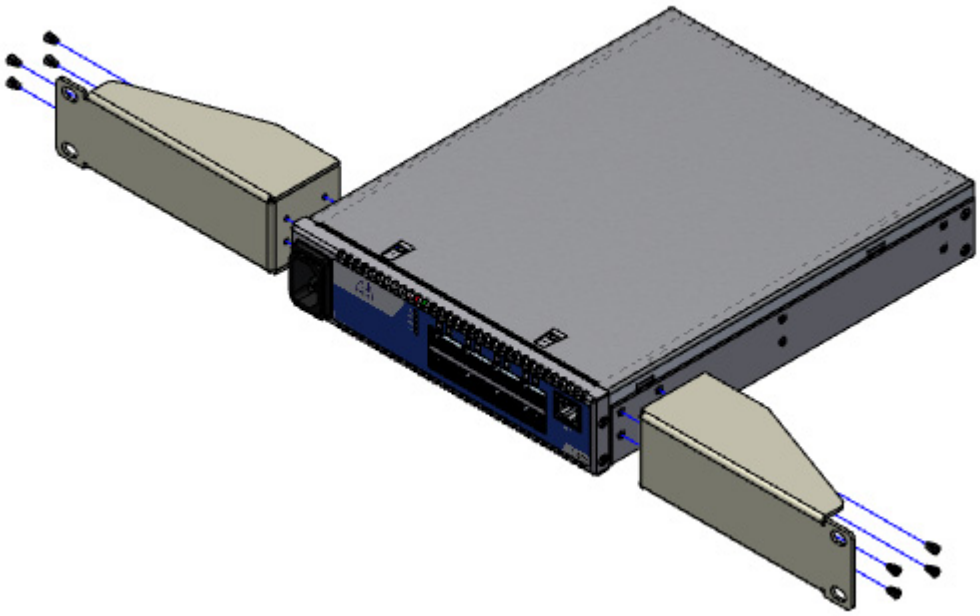


Figure 9: Connect the Mounting Brackets



3. Place four caged nuts into the rack at the U level you want to install the switch.
4. While supporting the switch catch and tighten the four bolts into the caged nuts.
5. Ground the switch.
6. Plug in the power cord.
7. You can start connecting all of the cables to the switch.

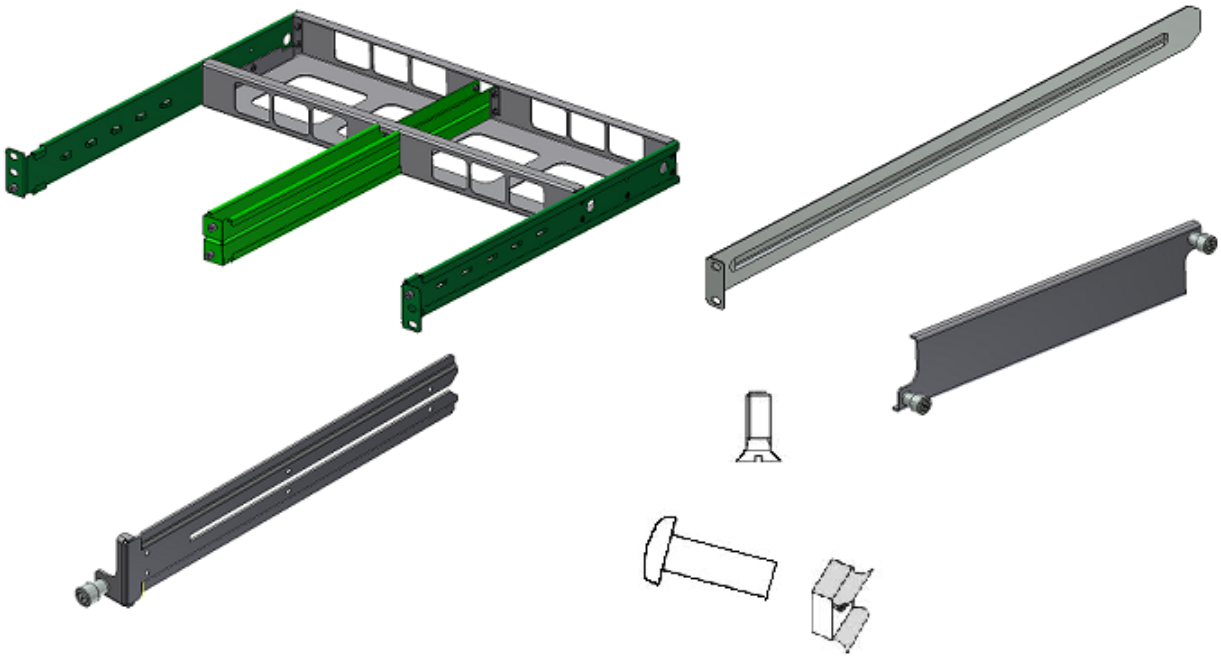
5.2.3 Installation Procedure for a Side by Side Installation

Installation kit parts for a side by side installation:

- 1 Two switch metal frame
- 4 switch mounted rails
- 24 flat head screws
- Two Rail Slides
- 8 pairs of caged nuts and bolts
- 1 blank cover

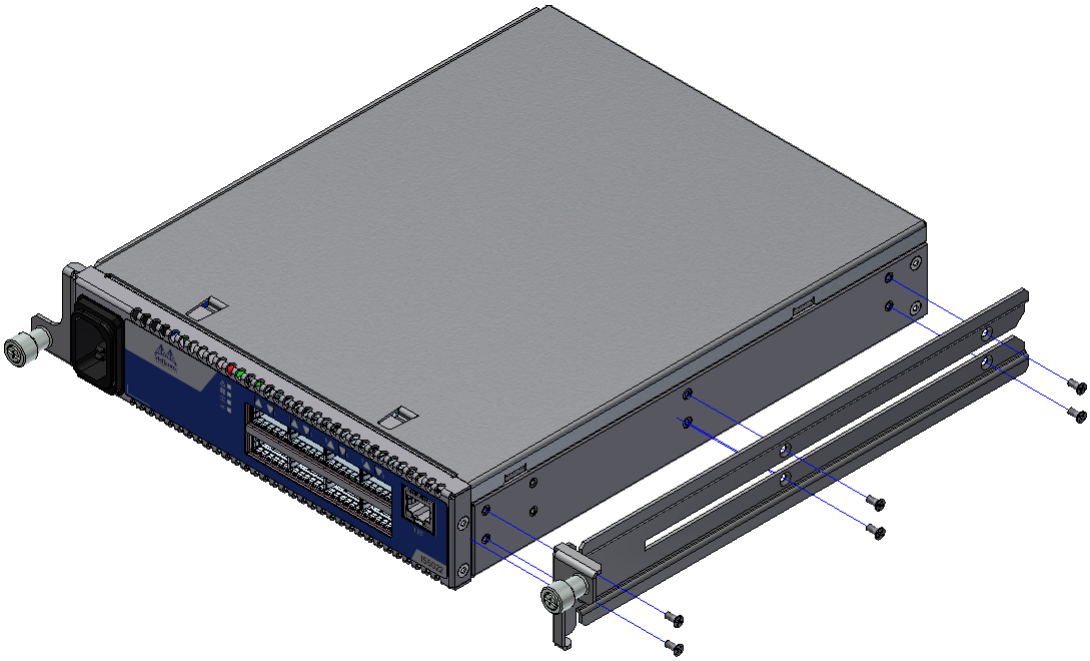
The Installation kits come with enough switch mounted rails and flat head screws to install two switches.

Figure 10: Installation Kit Parts for a Side by Side Installation



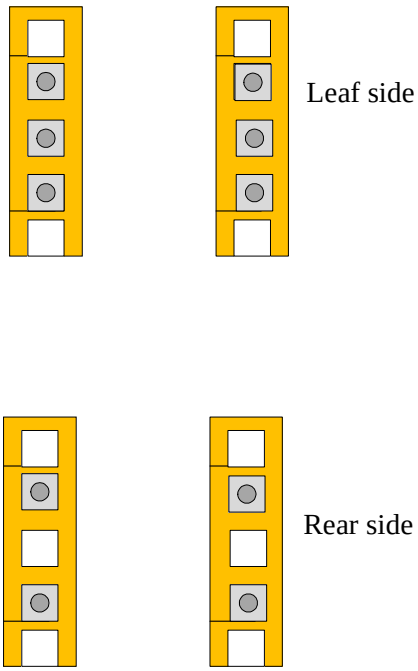
1. Place the ESD mat on the floor where you will be working and put on the ESD strap. Make sure the ESD strap is touching your skin and that the other end is connected to a verified ground.
2. Screw the two switch mounted rails to the switch using six flat head screws per rail.

Figure 11: Screw on the Switch Mounted Rails



3. Place eight caged nuts into the rack at the level you want to mount the switch. Four go on the Leaf side and four go on the rear side.

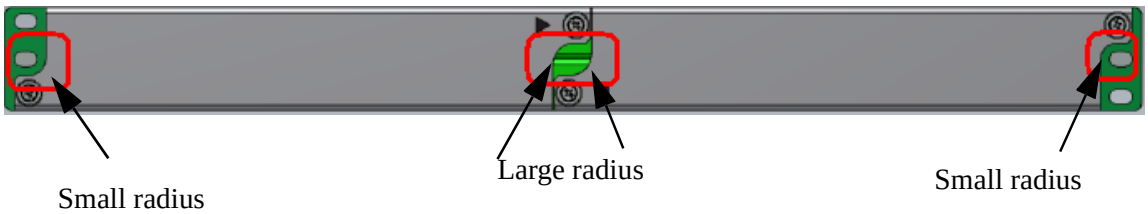
Figure 12: Caged Nut Placement



4. Install the *two switch frame* into the rack. This frame goes on the leaf side of the rack. **Do not tighten the screws into the caged nuts.**
5. Slide the rail slides into the frame and screw the bolts into the rack caged nuts on the rear side of the rack. **Do not tighten the screws into the caged nuts.**
6. Slide the switch into the frame, and screw in the capture bolts into the frame.
7. Tighten the capture nuts.
8. Install the blank into the frame opposite the switch, or install a second switch.

The front panel is not symetrical. The large radius always goes ot the center of the frame.

Figure 13: Front Panel Orientation



9. Tighten the capture nuts.
10. Tighten all eight screws for the caged nuts to 9.2 Nm or 81.5 pound inches.
11. Ground the switch.
12. Plug in the power cord.
13. You can start connecting all of the cables to the switch.

5.2.4 Grounding the Switch

Check to determine if your local or national electrical codes require an external ground to all IT components. If so, connect a ground wire to one of the casing screws and connect the other end to a valid ground. If you choose to not use the ground screw, make sure that the rack is properly grounded and that there is a valid ground connection between the chassis of the switch and the rack. Test the ground using an Ohm meter.

Some national and/or local codes may require IT components to be bonded and externally grounded (not including the power cord ground). You must follow all national and local codes when installing this equipment.

5.2.5 Power Connections and Initial Power On

The power cord is included in the installation kit.

Caution: The switch platform will automatically power on when AC power is applied. There is no power switch.

Caution: After inserting a power cable and confirming the green system status LED light is on; make sure that the Fan Status indicator shows green.

If the fan status indicator is not green then unplug the power connection and call your supplier.

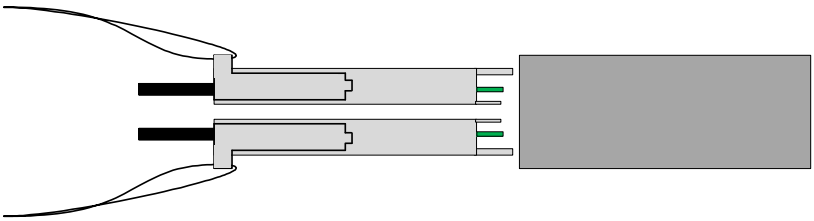
5.2.6 InfiniBand Cable Installation

All cables can be inserted or removed with the unit powered on. To insert a cable, press the connector into the port receptacle until the connector is firmly seated. The orange LED indicator corresponding to each QSFP port will light when the physical connection is established (that is, when the unit is powered on and a cable is plugged into the port with the other end of the connector plugged into a functioning port). After plugging in a cable, lock the connector using the latching

mechanism particular to the cable vendor. When a logical connection is made the green light will come on. When data is being transferred the light will blink green.

Cables in the bottom row should be inserted up side down in relation to the how the cables are inserted in the top row.

Figure 14: Top and Bottom Ports



To remove, disengage the locks and slowly pull the connector away from the port receptacle. The LED indicator will turn off when the cable is unseated.

Care should be taken not to impede the air exhaust flow through the ventilation holes next to the InfiniBand ports. Cable lengths should be used which allow for routing horizontally around to the side of the chassis before bending upward or downward in the rack.

5.3 Disassembly of the Switch from the Rack

5.3.1 Disassembly Procedure — Single Switch Centered Installation

To disassemble the switch from the rack:

1. Unplug and remove all connectors.
2. Unplug the power cord.
3. Remove the ground wire.
4. Remove the four M6 screws holding the switch to the rack. Support the switch while removing the screws, or the switch may fall out of the rack.
5. Loosen the two thumbscrews holding the switch in place.
6. Slide the switch out of the rack.

This switch needs to be supported when it is being disassembled.

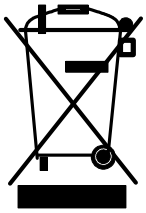
7. Remove the rails.
8. Remove the caged nuts.

5.3.2 Disassembly Procedure — Side by Side Installation

To disassemble the switch from the rack:

1. Unplug and remove all connectors.
2. Unplug the power cord.
3. Remove the ground wire.
4. Unscrew the 2 center bolts from the connector side of switch.
5. Slide the switch from the rack.
6. Remove the rail slides rails from the rack.
7. Remove the 10 caged nuts.

5.4 Disposal



According to the WEEE Directive 2002/96/EC, all waste electrical and electronic equipment (EEE) should be collected separately and not disposed of with regular household waste.

Dispose of this product and all of its parts in a responsible and environmentally friendly way.

For proper disassembly instructions see the Mellanox website.

5.5 Updating Firmware

When you buy the switch, it comes with the latest firmware burned on the board. All firmware updates should be done in-band. Go to the Mellanox Website and confirm that the firmware is the latest. If not reburn the latest firmware from the download site. New firmware versions will be posted on the Mellanox firmware download page:
http://www.mellanox.com => Support > Download Center.

You will need the Mellanox Firmware Tools package to update firmware for this switch. It can also be downloaded from:
http://www.mellanox.com. => Support > InfiniBand Software and Drivers.

You will also need to download and unzip the firmware binary image. This is provided in the Mellanox Web site at: http://www.mellanox.com => Support > Download Center and go to the InfiniScale IV Switch systems. Click in the Table for the firmware image that you need.

5.5.1 Current Firmware Revision

The user can query for the currently loaded firmware revision by using the command:

```
ibstat
```

(part of mft package). Other tools like flint can also be useful.

5.5.1.1 Instructions for Reprogramming Over the InfiniBand Network

To update an InfiniScale IV switch device having a specific GUID (for example, 0x00000006660abcd0) or LID, the following are the recommended steps to update the device firmware.

1. Make sure all subnet ports are in the active state. One way to check this is to run opensm, the Subnet Manager.

```
[root@mymach]> /etc/init.d/opensmd start
opensm start     [  OK  ]
```

2. Make sure the local ports are active by running 'ibv_devinfo'.
3. Obtain the device LID.

1. Use the "mst ib add" command:

The "mst ib add" runs the ibdiagnet/ibdiscover tool to discover the InfiniBand fabric and then lists the discovered IB nodes as an mst device under /dev/mst/ directory. These devices can be used for access by other MFT tools.

```
[root@mymach]> mst ib add
-I- Discovering the fabric - Running: ibdiagnet -skip all
-I- Added 10 in-band devices
```

2. List the discovered mst inband devices run "mst status".

```
[root@mymach]> mst status
MST modules:
------------
   MST PCI module loaded
   MST PCI configuration module loaded
...
Inband devices:
------------------
/dev/mst/CA_MT25418_sw005_HCA-1_lid-0x0001
/dev/mst/SW_MT47396_lid-0x0011
/dev/mst/SW_MT48438_lid-0x0003
```

Identify the switch you want to update according to its description or its LID.

in the examples below we will use `SW_MT48438_lid-0x0003 as our target switch.`

Query the switch to determine the current FW version:

```
[root@mymach]> flint -d /dev/mst/SW_MT48438_lid-0x0003 q
Image type:      FS2
FW Version:      7.3.0
Device ID:       48438
Chip Revision:   A0
Description:     Node           Sys image
GUIDs:           0002c902004177d8 0002c902004177db
Board ID:        n/a (MT_0D00110012)
VSD:             n/a
PSID:            MT_0D00110012
```

Burn the InfiniScale IV switch:

```
flint -d /dev/mst/SW_MT48438_lid-0x0003 -i ./fw-IS4-rel-7_4_0-Q_A1.bin -qq b
```

5.5.1.2 Reprogramming the Switch Through The I2C Port

This interface is for Debug and Troubleshooting only. This interface is for FAEs and advanced users only.

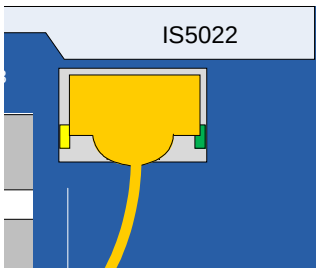
The I2C connector should only be used when the firmware cannot be updated in-band.

Use the MTUSB-1 adapter (available from Mellanox) to reprogram the switch firmware using a server or PC running MFT.

Figure 15: MTUSB-1 with Cables

The MTUSB adapter comes with three cables, but has only two connections for cables. One cable is an I2C cable with DB9 female connectors on both ends. One cable is a I2C cable with DB9 female connector to RJ45 male. Use the cable that matches your switch. The other is a USB cable with one type A host connection to be connected to the server or PC and a type B connection to be connected to the MTUSB adapter.

Figure 16: I2C Cable Connected to IS5022



With the switch connected to a computer through the MTUSB, it is now possible to reprogram the SPI Flash memory.

5.5.1.3 Instructions for Reprogramming Through the I2C Port

1. Make sure that:

   •the MTUSB I2C cable is connected to the switch and USB cable is connected to a computer

   •MFT is running on the computer

   •"mtusb-1" mst device appears in "mst status"
2. Set the switch I2C switch to allow access by running:

   ```
   > mlxi2c -d /dev/mst/mtusb-1 -s IS5023 p /IS4
   ```
3. Run the burn command:

   ```
   flint -d /dev/mst/mtusb-1 -i ./fw-IS4-rel-7_4_0-Q_A1.bin -qq b
   ```
4. Power cycle the switch, by unplugging and re-plugging the power cord, to load the new firmware.

5.5.2 How to Get Mellanox Firmware Tools (MFT)

Mellanox Firmware Tools (MFT) and documentation are available for download via http://www.mellanox.com > Support > Download Firmware Tools.

The MFT kit includes:

- mlxburn
- flint
- spark
- IBspark
- debug utilities

See “Related Documentation” on page 8.

5.5.3 Open SM

To manage the Mellanox switch system using OFED, download Mellanox Open Fabrics from http://www.mellanox.com > Support > InfiniBand Software and Drivers.

Be sure to read and follow all of the instructions regarding the installation and use of these tools.

6 Troubleshooting

As soon as a switch is plugged in, continuously monitor the status light. Make sure that it turns green within 30 seconds of booting up.

Status LED and Fan LED

If the Fan LED is red make sure that the ambient temperature is within the range specified in the Specification section of the Appendix.

If any of the LEDs are **red** after 30 seconds, unplug the switch and call your Mellanox representative.

Power supply unit:

1. Check that the power cable has a voltage within the range of 100 - 240 volts AC.

If the status LED is red.

2. Remove and reinstall the power cable.

The green power LED for the fans does not come on:

.

Caution: Do not run the switch if the System Status LED for the Fans is red or off!

The connector LED for the InfiniBand connector does not come on:

1. Check that both ends of the cable are connected.
2. Check that the locks on the ends are secured.
3. Make sure that the latest FW version is installed on both the HCA cards and the switch.
4. If media adapters are used, check that the all connections are good, tight, and secure.

The connector LED is flashing orange:

1. Check that the Subnet Manager has been started.
2. Check the cable is connected properly at borh ends.
3. Check the the cable is good.
4. Check that the connections are good(no cable weight on the connector, no twists in the cable at the connector...).
5. Check the port connectors at both ends.

The switch is off:

1. Unplug the switch.
2. Wait 5 minutes.
3. Plug in the switch.

4. If the switch does not come on, check the power supply.
5. If the switch comes on, Use the management software to determine the cause of the shut-down.
6. Check the temperature of the switch.
7. Check the ambient air temperature to make sure it is not too high.
8. Check the Fan status.

The switch is not working and unresponsive:

1. Unplug the switch.
2. Wait 5 minutes.
3. Plug in the switch.
4. If the switch does not come on, check the power supplies.
5. If the switch comes on, use the management software to determine the cause of the shut-down.

Appendix A: Specification

Table 8 - IS5022 Specification Data

Physical		Power and Environmental	
Size:	1.73” (1U) H x 7.9” W x 9.8” D 44mm X 200mm X 250mm	Input Voltage:	100-240 VAC 50-60Hz
Weight:	1.92kg 4.23 lbs	Power Consumption Typ: 8 port QDR	
Mounting:	19” Rack mount	Passive Cables	46W
		Active Cables	66W
SerDes Speeds	10, 20, 40 Gb/s per port		
Connectors and Cabling:	QSFP Cable	Power Consumption Max: 8 port QDR	
Optical Cable Max Length:		Passive Cables	55W
		Active Cables	75W
Port Types:	QSFP	QSFP Max Power per port for active cables:	2.0W
		Temperature:	0 to 45 Celsius
		Humidity:	10% - 90% non-condensing
Protocol Support		**Regulatory Compliance**	

Table 8 - IS5022 Specification Data

Physical		Power and Environmental	
InfiniBand: QoS: Management:	Auto-Negotiation of (40Gb/s, 20Gb/s, 10Gb/s) 8 InfiniBand Virtual Lanes for all ports Baseboard, Performance, and Device management Agents for full InfiniBand In-Band Management	Safety: EMC (Emissions): Environmental: Acoustic: Sound power level:	US/Canada: cTUVus EU: IEC60950 International: CB USA: FCC, Class A Canada: ICES, Class A EU: EN55022, Class A EU: EN55024, Class A EU: EN61000-3-2, Class A EU: EN61000-3-3, Class A Japan: VCCI, Class A EU: IEC 60068-2-64: Random Vibration EU: IEC 60068-2-29: Shocks, Type I / II EU: IEC 60068-2-32: Fall Test RoHS R-6 ISO 7779 ETS 300 753 70.5 dB(A) or 7.1 Bel
Scalability and Performance		**Reliability, Availability and Serviceability Features**	
Switching Performance: Addressing: Switching Capacity	Simultaneous wire-speed any port to any port 48K Unicast Addresses Max. per Subnet 16K Multicast Addresses per Subnet 640Gb/s		

A.1 EMC Certification Statements

Table 9 lists the approved certification status per switch in different regions of the world.

Table 9 - Switch Certification Status

Switch P/N	FCC Class (USA)	EN Class (Europe)	ICES Class (Canada)	VCCI (Japan)	cTUVus	CB
IS5022Q-1BRR	YES	YES	YES	YES	✓	✓
IS5022Q-1BFR	YES	YES	YES	YES	✓	✓

Table 9 - Switch Certification Status

Switch P/N	FCC Class (USA)	EN Class (Europe)	ICES Class (Canada)	VCCI (Japan)	cTUVus	CB
IS5022Q-1BFR	YES	YES	YES	YES	✓	✓
IS5022Q-1BRR	YES	YES	YES	YES	✓	✓
IS5022Q-1BFC	YES	YES	YES	YES	✓	✓
IS5022Q-1BRC	YES	YES	YES	YES	✓	✓

A.1.1 FCC Statements (USA)

Class A Statements:

§ 15.19(a)(4)

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

§ 15.21

Statement

Warning! Changes or modifications to this equipment not expressly approved by the party responsible for compliance (Mellanox Technologies) could void the user's authority to operate the equipment.

§15.105(a)

Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause

harmful interference in which case the user will be required to correct the interference at his own expense.

Statement

§ 15.21

Statement

Warning! Changes or modifications to this equipment not expressly approved by the party responsible for compliance (Mellanox Technologies) could void the user's authority to operate the equipment.

§15.105

Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

A.1.2 EN Statements (Europe)

EN55022 Class A Statement:

Warning
This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be

A.1.3 ICES Statements (Canada)

Class A Statement

"This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada."

Class B Statement

A.2 VCCI Statements (Japan)

Class A Statement:

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

(Translation - "This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.")

A.3 MIC Certification (Korea)

Korea's "Regulation for Certification of Information and Communication Equipment," requires EMC testing and certification for many electronic products. Korean EMC certifications are issued by Radio Research Laboratory (RRL), which is organized under the Ministry of Information and Communications (MIC). EMC testing includes electromagnetic emissions (EMI) and susceptibility (EMS). Certified equipment is labeled with the MIC mark and certification number.

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며 만약 잘못 판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

Translation:

Class A Device This device is registered for EMC requirements for industrial use. The seller or buyer should be aware of this. If this type was sold or purchased by mistake, it should be replaced with a residential-use type.

Appendix B: QSFP Interface

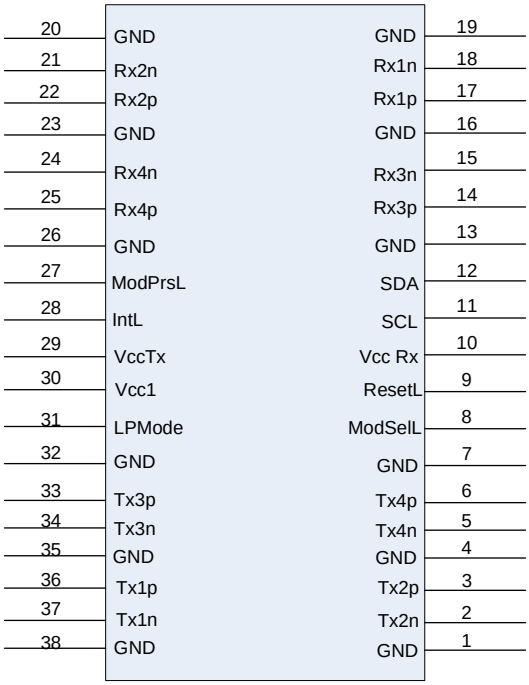
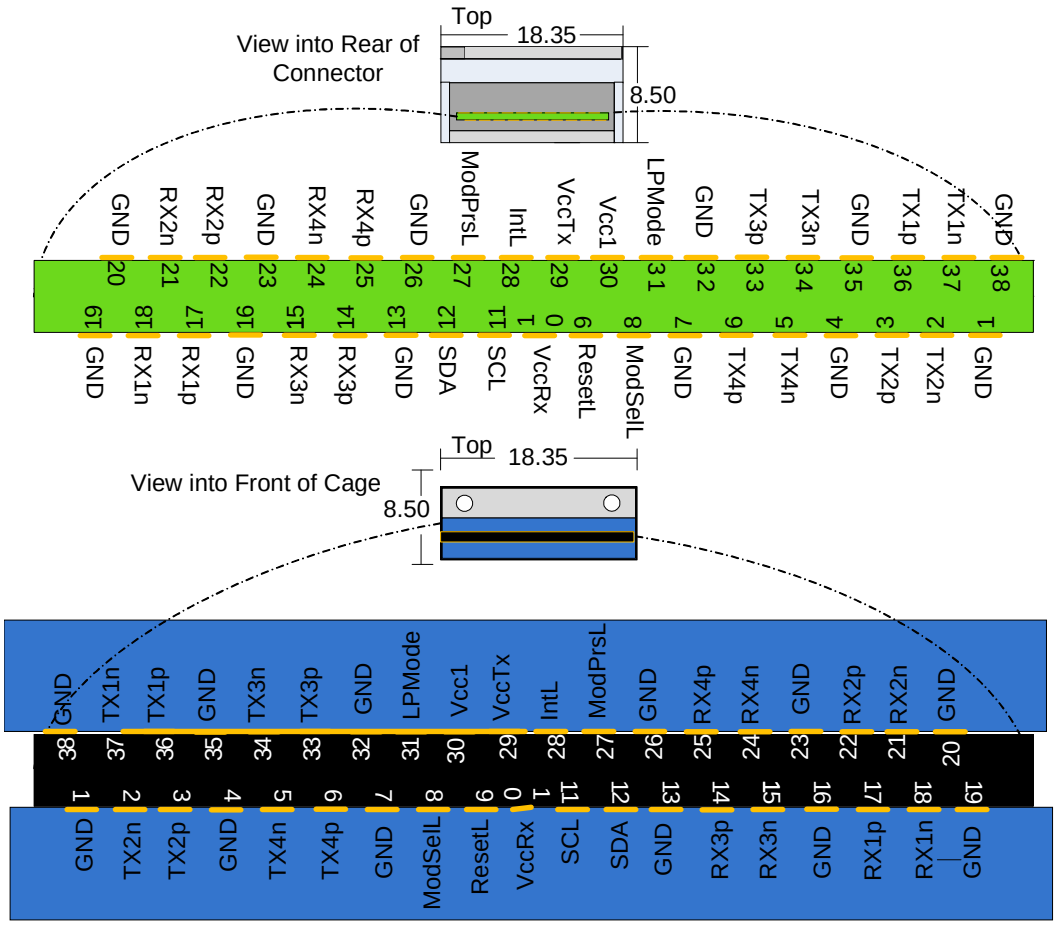


Table 10 - InfiniBand QSFP Connector Pinout

Connector Pin Number	Connector Pin Name	Signal Description
1	GND	Ground
2	Tx2n	Transmitter Inverted Data Input
3	Tx2p	Transmitter Non-Inverted Data Input
4	GND	Ground
5	Tx4n	Transmitter Inverted Data Input
6	Tx4p	Transmitter Non-Inverted Data Input
7	GND	Ground
8	ModSelL	Module Select
9	ResetL	Module Reset
10	Vcc Rx	+3.3 V Power supply receiver
11	SCL	2-wire serial interface clock
12	SDA	2-wire serial interface data
13	GND	Ground
14	Rx3p	Receiver Non-Inverted Data Output
15	Rx3n	Receiver Inverted Data Output
16	GND	Ground
17	Rx1p	Receiver Non-Inverted Data Output
18	Rx1n	Receiver Inverted Data Output
19	GND	Ground
20	GND	Ground
21	Rx2n	Receiver Inverted Data Output 3
22	Rx2p	Receiver Non-Inverted Data Output 3
23	GND	Ground
24	Rx4n	Receiver Inverted Data Output 3
25	Rx4p	Receiver Non-Inverted Data Output 3
26	GND	Ground
27	ModPrsL	Module Present
28	IntL	Interrupt
29	Vcc Tx	+3.3 V Power supply transmitter
30	Vcc 1	+3.3 V Power Supply
31	LPMode	Low Power Mode
32	GND	Ground
33	Tx3p	Transmitter Non-Inverted Data Input
34	Tx3n	Transmitter Inverted Data Input
35	GND	Ground
36	Tx1p	Transmitter Non-Inverted Data Input
37	Tx1n	Transmitter Inverted Data Input
38	GND	Ground

Figure 17: QSFP Male and Female Connections



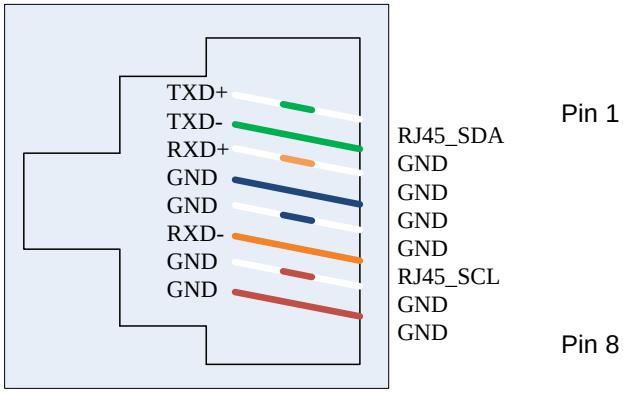
Appendix C: RJ45 I2C Interface

The RJ45 I2C interface uses the EIA 568A standard wiring color coding.

Looking into the Socket

I^2C

J34



Looking into the Socket

Appendix D: Replacement Parts Ordering Numbers

Table 11 - Replacement Parts Ordering Numbers

Part Description	OPN
Centered single switch installation kit	MIS000811
Side by side installation kit with long rail slides supports 19” racks with depth of 630mm-800mm	MIS000830
Side by side installation kit with short rail slides supports 19” racks with depth of 400mm-550mm	MIS000831
RS232 Cable DB9 to DB9 Harness	HAR000040
RS232 Cable RJ45 to DB9 Harness	HAR000028
I2C DB9 or RJ45 to USB Adapter	MTUSB-1
Power cord Type C13-C14 250V 10A 1.5M	ACC000251
Power cord Type C13-C14 250V 15A 2M RIGHT ANGLE	ACC000242
Power cord Type B for USA, Canada, Mexico, Taiwan Type B 6ft US 125V 10A chord	ACC000204
Power cord Type B for USA, Canada, Mexico, Taiwan 125V15A 4M USA UL (Type B) RIGHT ANGLE	ACC000241
Power cord Type H for Israel	ACC000205
Power cord Type E/F for Sweden, France, Germany, Netherlands, Russia	ACC000207
Power cord Type G for UK	ACC000208
Power cord Type D for India	ACC000209
Power cord Type I for China	ACC000210
Power cord Type J for Switzerland	ACC000211
Power cord Type B for Japan,	ACC000212
Power cord Type I for Australia	ACC000213

Appendix E: Avertissements de sécurité d'installation (French)

1. Instructions d'installation

Lisez toutes les instructions d'installation avant de brancher le matériel à la source d'alimentation électrique.

2. Température excessive

Ce matériel ne doit pas fonctionner dans une zone avec une température ambiante dépassant le maximum recommandé de 45°C (113°F). Un flux d'air de 200LFM à cette température ambiante maximale est nécessaire. En outre, pour garantir un bon écoulement de l'air, laissez au moins 8 cm (3 pouces) d'espace libre autour des ouvertures de ventilation.

3. Empilage du châssis

Le châssis ne doit pas être empilé sur un autre matériel. Si le châssis tombe, il peut provoquer des blessures corporelles et des dégradations de biens.

4. Orages – dangers électriques

Pendant un orage, il ne faut pas utiliser le matériel et il ne faut pas brancher ou débrancher les câbles.

5. Branchement/débranchement des câbles InfiniBand en cuivre

Les câbles InfiniBand en cuivre sont lourds et ne sont pas flexibles, il faut donc faire très attention en les branchant et en les débranchant des connecteurs. Consultez le fabricant des câbles pour connaître les mises en garde et les instructions spéciales.

6. Montage et entretien sur baie

Lorsque ce produit est monté ou entretenu sur baie, il faut prendre des précautions spéciales pour s'assurer que le système reste stable. En général, il faut remplir la baie avec du matériel de bas en haut.

7. Installation du matériel

Ce matériel ne doit être installé, remplacé ou entretenu que par du personnel formé et qualifié.

8. Elimination du matériel

L’élimination de ce matériel doit s’effectuer dans le respect de toutes les législations et réglementations nationales en vigueur.

9. Codes électriques locaux et nationaux

Ce matériel doit être installé dans le respect des codes électriques locaux et nationaux.

10. Cordons électriques CA homologués UL

Pour les prises électriques en Amérique du Nord, choisissez un cordon électrique homologué UL et certifié CSA

à 3 conducteurs, [18 AWG], terminé par une fiche moulée, d’une tension nominale de 125 V, [15 A], avec une longueur minimale de 1,5 m [6 pieds] et d’une longueur maximale de 4,5 m [18 pieds]

Pour les prises électriques en Europe, choisissez un cordon électrique harmonisé internationalement et marqué "<HAR>",

à 3 conducteurs, d’un diamètre de fil minimum de 0,75 mm2, d’une tension nominale de 300 V, avec une gaine isolée en PVC. Le cordon doit avoir une fiche moulée d’une tension nominale de 250 V et d’une intensité nominale de 10 A.

Appendix F: Installation - Sicherheitshinweise (German)

1. Installationsanleitungen

Lesen Sie alle Installationsanleitungen, bevor Sie das Gerät an die Stromversorgung anschließen.

2. Übertemperatur

Dieses Gerät sollte nicht in einem Bereich mit einer Umgebungstemperatur über der maximal empfohlenen Temperatur von 45°C (113°F) betrieben werden. Es ist ein Luftstrom von 200 LFM bei maximaler Umgebungstemperatur erforderlich. Außerdem sollten mindestens 8 cm (3 in.) Freiraum um die Belüftungsöffnungen sein, um einen einwandfreien Luftstrom zu gewährleisten.

3. Stapeln des Chassis

Das Chassis sollte nicht auf andere Geräte gestapelt werden. Wenn das Chassis herunterfällt, kann es zu Verletzungen und Beschädigungen an Geräten führen.

4. Bei Gewitter - Elektrische Gefahr

Arbeiten Sie während eines Gewitters und Blitzschlag nicht am Gerät, schließen Sie keine Kabel an oder ab.

5. Anschließen/Trennen von InfiniBand-Kupferkabel

InfiniBand-Kupferkabel sind schwer und nicht flexible. Deshalb müssen sie vorsichtig an die Anschlüsse angebracht bzw. davon getrennt werden. Lesen Sie die speziellen Warnungen und Anleitungen des Kabelherstellers.

6. Rack-Montage und Wartung

Wenn dieses Produkt in einem Rack montiert oder gewartet wird, sind besondere Vorsichtsmaßnahmen zu ergreifen, um die Stabilität des Systems zu gewährleisten. Im Allgemeinen sollten Sie das Gestell von unten nach oben mit Geräten füllen.

7. Geräteinstallation

Diese Gerät sollte nur von geschultem und qualifiziertem Personal installiert, ausgetauscht oder gewartet werden.

8. Geräteentsorgung

Die Entsorgung dieses Geräts sollte unter Beachtung aller nationalen Gesetze Bestimmungen erfolgen.

9. Regionale und nationale elektrische Bestimmungen

Dieses Gerät sollte unter Beachtung der regionalen und nationalen elektrischen Bestimmungen installiert werden.

Appendix G: Advertencias de seguridad para la instalación (Spanish)

1. Instrucciones de instalación

Antes de conectar el equipo a la fuente de alimentación, leer todas las instrucciones de instalación.

2. Sobrecalentamiento

No se debe utilizar el equipo en un área con una temperatura ambiente superior a la máxima recomendada: 45°C. Además, para garantizar una circulación de aire adecuada, se debe dejar como mínimo un espacio de 8 cm (3 pulgadas) alrededor de las aberturas de ventilación.

3. Apilamiento del chasis

Los chasis no se deben apilar sobre otros equipos. La caída del chasis podría causar lesiones corporales, así como daños al equipo.

4. Cuando hay rayos: peligro de descarga eléctrica

No utilizar el equipo ni conectar o desconectar cables durante períodos de actividad de rayos.

5. Conexión y desconexión del cable Copper InfiniBand

Dado que los cables de cobre InfiniBand son pesados y no son flexibles, su conexión a los conectores y su desconexión se deben efectuar con mucho cuidado. Para ver advertencias o instrucciones especiales, consultar al fabricante del cable.

6. Montaje y mantenimiento de bastidores

Al instalar o realizar el mantenimiento de este aparato en un bastidor, es preciso adoptar precauciones especiales para garantizar que el sistema se mantenga estable. En general, en un bastidor, los equipos se deben instalar comenzando desde abajo hacia arriba.

7. Instalación de equipos

La instalación, el reemplazo y el mantenimiento de este equipo estarán a cargo únicamente de personal capacitado y competente.

8. Asegurar confinamientos adecuados

El fabricante del producto final o el usuario final deberán suministrar un confinamiento adecuado para componentes eléctricos y mecánicos y contra incendio.

9. Eliminación de equipos

La eliminación definitiva de este equipo se debe efectuar conforme a todas las leyes y reglamentaciones nacionales.

10. Códigos eléctricos locales y nacionales

Este equipo se debe instalar conforme a los códigos eléctricos locales y nacionales.

11. **Cable de alimentación homologado por UL y con certificación CSA**

En conexiones de América del Norte, seleccionar un cable de alimentación homologado por UL y con certificación CSA de tres conductores, [16 AWG], terminado en un enchufe moldeado con capuchón de 125 voltios nominal, [13 A], con una longitud mínima de 1,5 metros, pero no más de 4,5 metros.

En conexiones europeas, seleccionar un cable de alimentación armonizado internacionalmente y marcado "<HAR>", de tres conductores, hilo de 1,0 mm2 como mínimo, 300 voltios nominal, con cobertura protectora aislante de PVC. El cable debe tener un enchufe moldeado con capuchón de 250 voltios nominal, 10 A.

12. Añadir conexión a tierra

Antes de conectar el dispositivo a la línea de alimentación, los tornillos del terminal de la puesta a tierra de protección del dispositivo se deben conectar a la puesta a tierra de protección de la instalación del edificio.

(Información de conexión a tierra):

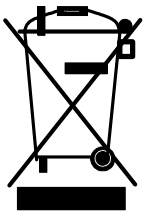
La instalación del edificio deberá prover un medio para la conexión con la puesta a tierra de protección y un técnico de servicio deberá conectar permanentemente el equipo a dicho medio de conexión.

Un TÉCNICO DE SERVICIO comprobará si la toma eléctrica de la que se suministrará corriente al equipo provee una conexión con la puesta a tierra de protección del edificio. De no ser así, el TÉCNICO DE SERVICIO se encargará de instalar un CONDUCTOR DE CONEXIÓN A TIERRA DE PROTECCIÓN, del terminal de puesta a tierra de protección separado al conductor de tierra de protección del edificio. El equipo se instalará en un área donde haya conexión equipotencial, como por ejemplo, un centro de telecomunicaciones o una sala de computadoras dedicada.

13. Códigos de instalación

Este dispositivo se debe instalar conforme a la versión más reciente de los códigos eléctricos nacionales del país en cuestión. En América del Norte, el equipo se debe instalar de acuerdo con las disposiciones vigentes del Código Eléctrico Nacional de los EE.UU. y del Código Eléctrico de Canadá.

14. Directiva sobre RAEE



Conforme a la Directiva 2002/96/CE sobre RAEE, todos los residuos de equipos eléctricos y electrónicos (EEE) se deben recolectar por separado y no se deben eliminar junto con residuos domésticos.

Al deshacerse de este producto y de todas sus partes, hágalo de una manera responsable y respetuosa con el medio ambiente.

Appendix H: Special Regulations Regarding Finland, Sweden, Denmark, and Norway

Denmark- This unit is class I and must be connected with an AC cord compliant with all national electrical codes in Denmark. The AC cord shall have an integral ground wire, and can only be plugged into a fully grounded outlet.

Do not connect this unit to any outlet that is not fully grounded!

- **Finland** -

“Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan”

- **Norway** -

“Apparatet må tilkoples jordet stikkontakt”

Unit is intended for connection to IT power systems for Norway only.

- **Sweden** -

“Apparaten skall anslutas till jordat uttag.”